



The Oil DROP

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"The Oil DROP" is an informal journal, produced twice a year by EPA's Oil Program Center. The goal of "The Oil DROP" is to attract a broad audience, including concerned citizens and environmental groups. "The Oil DROP" is distributed in hardcopy and is available on the Oil Program homepage at www.epa.gov/oilspill.

Galion Heating Oil Spill Incident

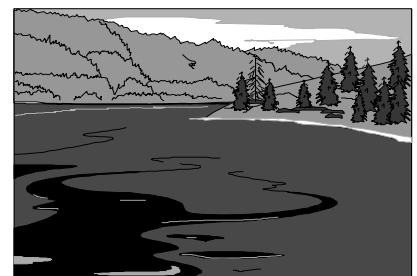
On August 25, 1997, the discovery of a fuel odor and discolored water in a ditch near the Olentangy River in Crawford County, Ohio, prompted a local resident to notify the Galion fire department. Within hours, the Ohio Environmental Protection Agency (OEPA) and the U.S. EPA response center responded to the suspected oil spill.

An oil spill was confirmed to have occurred on August 20, 1997, when a 275 gallon tank containing heating oil collapsed and released approximately 250 gallons of heating oil into the basement of a resident of Crawford County, Ohio. The oil eventually drained from the basement into a tributary of the Olentangy River via a septic tank. Almost three-quarters to one mile of the creek was affected by the spill.

A vacuum truck was used to collect the oil in limited areas of the creek, and sorbent pads were used to soak up oil in the remaining areas. The vacuum also was used to clean up oil in the basement where the spill occurred. The Galion and Whetstone fire departments discharged 14,000 gallons of water downstream where a siphon dam had been established. The site will be reviewed periodically until it is determined that all of the oil has been removed.

Train Derailment Shows Importance of Early Response to Spills on Water

Two locomotives spilled 5,100 gallons of diesel fuel after a Conrail freight train derailed on November 3, 1997, near Danby, Tompkins County, New York. Previous heavy rains caused the tracks to wash out, causing the derailment. Diesel fuel



from one of the locomotives spilled into Inlet Creek, impacting eight miles of the creek, stopping one and a half miles upstream of the area's drinking source, Cayuga Lake. Conrail, the potentially responsible party, employed contractors to clean up the area using deployed boom and sorbent pads. Within 48 hours, 3,000 gallons of the spilled oil had been recovered. Representatives of the New York Department of Environmental Conservation and EPA Region 2 were present at clean up. Although no fish kills have been observed, some other wildlife impacts have been observed.

Immediate response to oil spills, such as those caused by the Conrail derailment, is crucial due to the factors of wind speed and surface current affecting oil spill movement in water, with surface currents dominating spill movement. The rate and direction of spilled oil depends on the consistency of the oil and weather conditions. Diesel fuel, the type of oil contained within the overturned locomotive, has properties of both light, volatile oils and moderate to heavy oils. Some of these properties include moderate to high viscosity, fairly rapid to rapid evaporation, and the ability to be removed from surface water. At the time of a spill, the type of oil spilled and the weather conditions under which the spill occurred are measurements that should be made. Immediate containment of the oil is crucial to keep it from spreading widely and to keep removal costs down.

Response to oil spills also depends on what type of water body the spill occurs in, as different characteristics of the body of water determine spill movement. Creeks, such as Inlet Creek where the derailment occurred, are shallow bodies of water with little or no flow and, therefore,

with little surface water velocity. Thus, oil spill movement in creeks is largely a factor due to wind speed. Crossing creeks can be accomplished with culverts or bridges, which may be structures that are used to stop the flow of the oil slick. People have easy access to bridges and culverts, allowing for easier cleanup of the oil, which is usually conducted by crews on foot along the bank and in the water.

Oil Company Makes Environmentalist's Dream Settlement

Last October, the Washington Post reported that the Colonial Pipeline Company agreed to a settlement that is making the community and environmentalists very happy. Not only has the company agreed to pay a \$1.5 million civil penalty and \$100,000 in restitution to the state and federal governments, but it will also take on 17 projects in Northern Virginia, including construction of a walking trail and a nature observation deck and improvements to a boat launching area and a park in Fairfax County. The projects are expected to cost the company about \$2 million more than the \$25 million it has already spent on cleanup and inspection costs.

In Herndon, Colonial Pipeline will connect the Washington & Old Dominion Trail and the Sugarland Run Trail, which are currently several blocks from each other. The company will also build a raised boardwalk with an observation platform which will provide views of the Potomac in the Dyke Marsh Wildlife Preserve south of Alexandria. Colonial has also agreed to clean up a boat launching area in Washington, D.C. -- fixing

picnic tables and barbeque grills, and adding more stone and gravel to the launching area to stop erosion. In the Sugarland Run Stream Valley Park in Fairfax, Colonial will plant shrubs and reforest the area with native trees and plants.

The spill that led to the settlement involved 400,000 gallons of diesel fuel that leaked into Sugarland Run, a stream that runs into the Potomac River, after a Colonial oil line ruptured. The fuel was found on shorelines as far as 50 miles away.

What Makes Up Crude Oil?

Light crude will contain between -

- 40% to 50% alkane (straight chain organic compounds)
- 25% to 30% aromatics (cyclic compounds like benzene)
- 1% to 2% asphaltines (polycyclic compounds like phenentherenes)
- 10% to 12% waxes and paraffins



As crude becomes heavy it may change as follows:

- % of Alkanes will decrease to approximately 40%
- % of aromatics will increase slightly

- Asphaltines will increase to between 4% and 5%
- Increase in waxes and paraffins to 18%, 19%, or 20%

Sweet Crude (such as Louisiana sweet crude oil) contains sulfur. The sulfur is found mainly in the heavy components like paraffins. The concentration of sulfur is approximately 2%.

These benchmark ranges apply only to crude oil, and not to refined petroleum products.

Oiled Wildlife Care Network

California's Department of Fish and Wildlife, Office of Oil Spill Prevention and Response (OSPR), has created the first state-run network of private wildlife care centers along California's shoreline. Since 1971, when two tankers collided under the Golden Gate Bridge, an informal network of oiled wildlife care providers called the International Bird Rescue and Research Center (IBRRC) has been working to help oiled wildlife off the coast of California. In order to unify and formalize the effort and better serve oiled wildlife, the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990 was enacted in California, requiring OSPR to establish a formal oiled wildlife network.

Because the original act only provided funding for one care center, which is primarily for sea otters, State Senator Diane Watson wrote follow-up legislation to establish funding for the network by allowing the interest earned on California's emergency response fund to be used to develop more stations along the

shoreline.

Many established wildlife care organizations have agreed to participate in the network. Sea World in San Diego can care for up to 400 marine birds and 20 marine mammals or sea turtles. The IBRRC center in Los Angeles will provide oil spill response and ongoing wildlife rehabilitation, as well as school education programs and professional training, at its facilities. In San Francisco, the Marine Mammal Center can accept up to 40 oiled pinnipeds and can assist with the care of sea otters. The University of California at Davis, School of Veterinary Medicine, will provide clinical care for endangered species and wildlife needing intensive care, and training to ensure that spill standards and protocols are met throughout the network. Combined, over a dozen different organizations will help with the network.

For more information on the Oiled Wildlife Care Network, contact OSPR at (916) 445-9338.

The Trans Alaska Pipeline

The trans Alaska pipeline celebrated the 20th anniversary of its completion in 1997. This pipeline carries more than 20 percent of U.S. domestic oil production and is considered a technological and engineering marvel.

After the discovery of oil at Prudhoe Bay in 1968, plans were made to design and construct an 800-mile pipeline beginning at Prudhoe Bay and ending at Valdez Marine Terminal. Engineers had to design and build the pipeline that would cross mountain ranges, permafrost landscape, various bodies of water,

and animal migration routes. Construction began on March 27, 1975, and ended on May 31, 1977; the first oil flowed on June 20, 1977. The total cost of the project was \$8 billion. The design, construction, and operation and maintenance of the pipeline is the responsibility of Alyeska Pipeline Service Company, but the pipeline is actually owned by seven companies.

In order to protect the environment, several provisions regarding the pipeline were made, including the designation of over 500 places for animal migration, and design of the pipeline to withstand earthquakes measuring up to 8.5 on the Richter scale. In order to allow animal migration, the pipeline was elevated at a minimum of five feet above ground, and, at special animal crossings, the elevation was raised

Photo courtesy of the Alyeska Pipeline Service Company

to ten feet above ground. In order to withstand the stresses of seismic activity and temperature fluctuations, the pipes were designed to move side to side and up and down, and to



contract and expand by bending along built-in zigzags. Almost half of the pipeline is built above ground to prevent a permafrost thaw.

Up to 1.7 million barrels of oil move through the high-tensile carbon steel pipeline every day. The oil movement through the pipeline is

monitored over 10 pump stations. Devices called "pigs" are used to clean interior pipe walls, survey interior pipe shape, and detect corrosion. The entire operation is monitored 24 hours a day at the Operations Control Center, which is located at the Valdez Marine Terminal. Once the oil reaches Valdez Marine Terminal, the crude oil (liquid petroleum) is removed from the pipeline and placed into tankers, which will carry the oil to U.S. markets.

Many agencies regulate Alyeska,



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S. Coast Guard, EPA, and the Alaska Department of Game and Fish. Measures are taken by Alyeska for oil spill prevention and response 24 hours a day. Oil spill equipment is located at the main terminal and other locations in Prince William Sound. In addition, Escort Response Vessels accompany tankers holding anywhere from 0.2 million to 1.8 million barrels of oil through the Sound.

Oiled Birds and Tar Balls Along the California Coast¹

¹Reprinted with permission from Golob's Oil Pollution Bulletin, published biweekly by World Information Systems, P.O. Box 535, Harvard Square Station, Cambridge, MA 02238; tel: 800-666-4430.

The saga of the vegetable oil spill slick in Monterey Bay, California, grows more mysterious. The oil spill that occurred in October of last year continues to cause havoc and is still clogging up the feathers of hundreds of frustrated birds. It is also the reason tar balls are being washed ashore on the beaches of northern California.

Dana Michaels, public affairs officer for the California Department of Fish and Game's Office of Oil Spill Prevention and Response (OSPR), has reported that, since January 17, a total of 420 live oiled birds and 800 dead oiled birds have been recovered



at scattered locations along a 200-kilometer stretch of the California coast, extending as far north as Point Reyes and as far south as Carmel. An initial Coast Guard investigation done in late October of last year estimated that up to 2,300 gallons of the oil were spilled, making up only a three-mile slick.

The affected species include common murre, grebes, gulls, loons, and scoters, as well as snowy plovers and brown pelicans, which are both federally-protected species. About 200 of the live oiled birds are being treated at OSPR's Oiled Wildlife Veterinary Care and Research Center in Santa Cruz, while the rest have been transported to the International Bird Rescue Research Center in Berkeley.

A chemical analysis of the oil done at the time of the spill at a Coast Guard laboratory in Groton, Connecticut, strongly indicated that the substance was hydrogenated oil and that there was a slim possibility that it was some form of animal fat, such as fish oil. According to Michaels, OSPR still has not yet determined the source or type of oil involved, but samples of the oil have been sent to federal and state laboratories for analysis. "We are reluctant to characterize this as a spill, because we cannot say for sure that the oil was discharged by a ship or a pipeline," Michaels said. "However, our veterinarians are saying that many of the recovered birds have been soaked through to the skin with oil, which indicates that there are some large patches of oil somewhere off the coast, and that the oil probably did not come from a natural seep."

Tar balls

What are tar balls and how do they form? Tar balls, the little dark colored pieces of oil that stick to our feet and towel when we go to the beach, are actually remnants of oil spills. When crude oil (or some of its heavier products) spends even a short time floating on the ocean surface, the physical characteristics of the oil change.

During the first few hours of the spill, the oil will spread into a thin slick. Over a period of time, a combination of wind and waves will tear apart the slick into smaller patches that are scattered over a much wider area. In addition, the oil will begin to change its appearance due to various physical, chemical, and biological processes which are generally called "weathering."

Initially, the lighter parts of the oil

will evaporate, much like a small gasoline spill. For heavier types of oil, such as crude or home heating oil, much of the oil remains behind. At the same time, some crude oils will take in water and form an emulsion that often looks like chocolate pudding or mousse. This emulsion is much thicker and stickier than the original oil. Winds and waves will continue to stretch and tear the oil patches into smaller pieces or tar balls. While some tar balls may be as large as pancakes, most are coin-sized.

Tar balls are very persistent in the marine environment and can travel hundreds of miles. Tar balls are probably not hazardous to your health. For most people, occasional brief contact with a small amount of oil will do no harm. However, some individuals are more sensitive than others to certain chemicals, such as hydrocarbons found in crude oil and petroleum products. They may develop rashes and allergic reactions even from brief casual contact with the oil.

In general, contact with oil should be avoided. If such contact occurs, the area should be washed with soap and water, baby oil, or other widely-used and safe cleaning compound, such as the paste sold at auto part stores. Using solvents, gasoline, kerosene, diesel fuel, and the like on the skin should be avoided.

Once tar balls hit the beach, they may be picked up by hand or by beach cleaning machinery. If the impact is severe, the top layer of sand containing the tar balls may be removed and replaced with clean sand.

The number of tar balls you may find on any beach depends on several factors: tanker traffic, wind patterns, sea currents, whether an oil spill

occurred recently, and how often the beach is cleaned. Generally, east coast beaches are not more polluted with tar balls than beaches along the west coast of the United States.

New tar balls appearing on a beach may be an indication of an oil spill. If you notice an unusual number of tar balls on the beaches, call the United States Coast Guard at (800) 424-8802.

ERT and Atlantic Strike Force in Joint Effort

The Environmental Response Team (ERT) in Edison, New Jersey, is involved in a joint project with the U. S. Coast Guard's Atlantic Strike Team to provide technical assistance to the Strike Team for monitoring dispersed oil slicks using a fluorometer. The ERT, as part of its ongoing interest in developing field analytical capability, has been developing Standard Operating Procedures (SOPs) that the Strike Team can use to ascertain oil in water concentrations within a chemically dispersed oil slick.

Several training sessions have taken place. One session was an out-to-sea run where the ERT demonstrated the capacity to measure fluorescible compounds in water using a fluorosein dye to simulate oil in water concentrations. The other two sessions involved Atlantic Strike Team technicians coming to Edison to receive hands-on training on the actual operation of the instrument and with preparation of standards and calibration of the instrument using these standards.

In future efforts, the ERT will train other Strike Teams and advance the

protocols by generating better in-water standards to enable better quantification in the field.

For more information, contact Royal J. Nadeau at (732) 321-6743 or nadeau.royal@epamail.epa.gov.

Bioremediation

Two recently released studies have concluded that bioremediation, the microbial process of breaking down hazardous substances into less dangerous ones, has been used



successfully as a remedy in cleaning up toxic waste sites. In one report, a newly discovered bacterium, *Dehalococcoides ethenogenes* Strain 195, thrives on a diet composed of the toxic chemicals trichloroethylene (TCE) and perchloroethylene (PCE). Though not soluble in water, these two substances are found in groundwater at EPA Superfund sites because they are heavier than water and can sink below the water level at the site.

D. ethenogenes breaks down TCE and PCE into ethylene, a harmless gas that is a plant hormone causing fruit to ripen and also the basic component of polyethylene plastics. This bacteria achieves this conversion by taking the chlorine atoms as electron acceptors and replacing the chlorine atoms with hydrogen atoms. The end-product released is hydrochloric acid. The breakdown process can only work in the presence of certain other bacteria and copious amounts of vitamin B12.

In a second report, researchers at

Delaware Bay conducted a study to determine the rate of biodegradation of crude oil. The researchers established four sets of blocks, each block divided into four plots. The plots in three of the four blocks were oiled with the weathered crude oil Bonny Light (Escravos), and one of the plots of the four blocks served as the control plot, containing only sand with no oil and no treatment. The three oiled plots contained one of the following treatments: addition of no nutrients (untreated plot), addition of water-soluble nutrients (treated plot), and addition of water-soluble nutrients supplemented with a natural microbial inoculum from the site (treated plot).

Every 14 days, samples from the plots on the beach were collected and analyzed for microbiology, oil chemistry, nutrients, and rate of biodegradation of the crude oil. The researchers observed that the untreated plot did show substantial degradation of the oil because of the high amount of nutrients present at the site that support the naturally occurring microbial populations; hence, the rate of biodegradation increased. They also observed that biodegradation occurred more in the upper intertidal zone than in the lower intertidal area because the upper intertidal zone is exposed to more oxygen, which is needed by the microbes. The plot with supplemented microbial populations did not further increase the rate of biodegradation because the microbes could not compete with the natural microbial populations present.

As a result of this study, the researchers suggest that when an oil spill occurs, the background nutrient level should be measured, and the microbial populations present should be determined because these two factors determine the rate of biodegradation at the site of an oil

spill.

Human Hair as Oil Spill Sorbent Material²

The National Aeronautic and Space Administration's (NASA's) Marshall Center in Huntsville, Alabama, is testing an unusual sorbent material for oil spill cleanups—human hair. NASA is conducting the tests in cooperation with a Madison, Alabaman-based company, BEPS, Inc., whose president, Philip McCrory, has patented the idea of using human hair to clean up spilled oil. "My inspiration came in 1989 when I was watching news coverage of the Exxon Valdez oil spill in Prince William Sound, and I saw an otter whose fur was saturated with oil," according to McCrory. "I thought, if animal fur can trap and hold spilled oil, why shouldn't human hair work equally well?" To test this idea, McCrory, who is a hairdresser by trade, filled a nylon stocking with about five pounds of human hair, and placed the hair-filled stocking in a pool of water with about one gallon of used motor oil. "The oil was immediately absorbed onto the hair in the stocking; I couldn't see a trace of oil left on the water," McCrory said. McCrory subsequently conducted several additional tests on his own, with "very promising" results. In one test, McCrory passed a mixture of 15 gallons of diesel fuel and 40 gallons of water through a nylon sack containing 16 pounds of human

hair. After passing through the sack one time, the water was found to have a diesel concentration of only 17 parts per million, McCrory said. Last year, McCrory approached the Marshall Center's Technology Transfer Office with a request to test the concept under controlled laboratory conditions. NASA agreed to conduct the tests, and the results are expected soon, McCrory said. He noted that, if his concept proves successful, he would be interested in licensing the idea to a spill response product manufacturer. For further information, contact Philip McCrory, BEPS, Inc., 217 Knox Creek Trail, Madison, AL 35758, or at (205) 830-8392, or (205) 864-0381 (fax).

Bobbie Lively-Diebold Retires after 20 Years of Federal Service

Bobbie Lively-Diebold retired in February 1998, after 20 years of service with the federal government. Bobbie began working for the government in the Chicago office of Housing and Urban Development (HUD) in 1977. While still in Chicago, she transferred to Region 5 of EPA in 1979. She moved to Washington, D.C., in 1985 to work with the EPA Superfund Program. Due to illness, Bobbie transferred to the Oil Pollution Response and



²Reprinted with permission from Golob's Oil Pollution Bulletin, published biweekly by World Information Systems, P.O. Box 535, Harvard Square Station, Cambridge, MA 02238; tel: 800-666-4430.

Abatement Branch of EPA in 1990 and was able to continue her excellent service to EPA from her home office. The following awards were presented to Bobbie during her 20 years of dedication and service: the EPA Bronze Medal Award, the Vice President's Hammer Award, Special Achievement Awards, the U.S. Coast Guard Public Service Award, and many others. During her retirement, Bobbie will enjoy being a wife, mother of seven, grandmother of seven, and pursuing her many hobbies. EPA appreciates and will miss her service.

The following poem was written to honor Bobbie upon her retirement. Bobbie is a world-class gardener and a botanist by training.

A Stroll Through Bobbie's Garden
by John Gustafson

*She's no pansy;
Maybe a little poppy
From time-to-time,
But not a pansy,
That's for sure.*

*And definitely not a shrinking
violet.
And not a daffy-dil.
A morning glory-- yes.*

*When faced with opposition,
Her motto--
They won't croak-us!*



*Not a shrinking violet,
Not a pansy,
But,
Just,
Always a rose.*

Happy Retirement!



Visit the Oil Spill Program at
<http://www.epa.gov/oilspill>.

To report oil and chemical spills, call

1-800-424-8802